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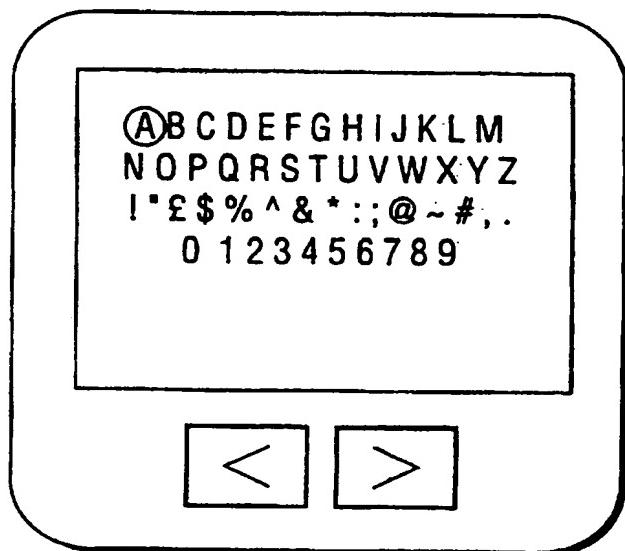
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 GB 2205669 A GB 2180973 A GB 2156560 A  
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 Graphic user interface

(57) An interface for inputting data comprises two manually operable direction buttons, and microprocessor means for outputting signals generating a visual display comprising a menu, and in response to operation of the buttons enabling a user to make selections from the menu and to cause relative movement between the menu and a cursor, the microprocessor being adapted to respond to intermittent pressure of a single button to step the cursor relative to the menu in either a first or a second direction in dependence upon the button depressed.

**FIG. 1****BEST AVAILABLE COPY**

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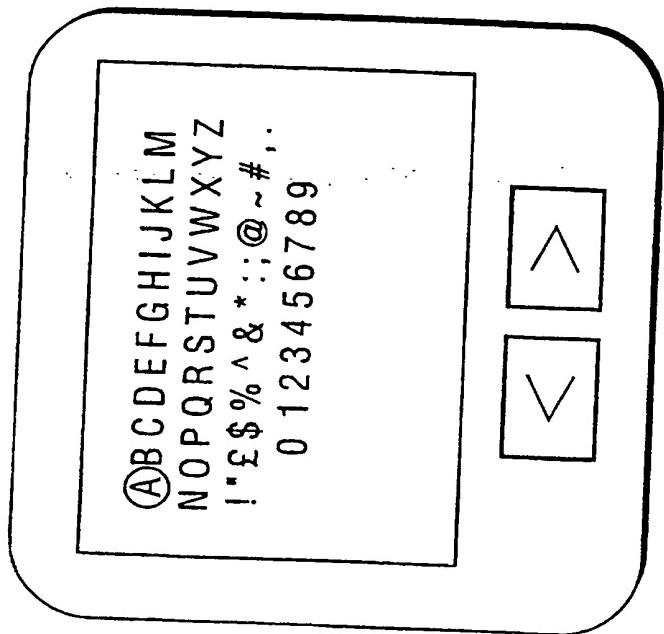


FIG. 1

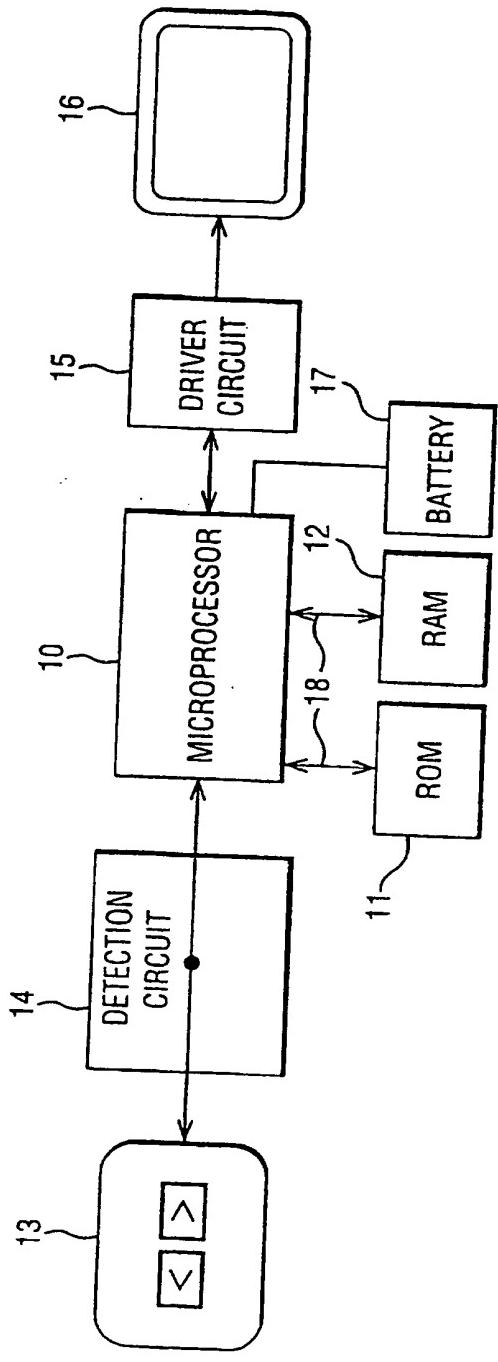


FIG. 3

**FIG. 2****TABLE 1**

NAME	STATE	LEFT KEY ACTION	RIGHT KEY ACTION	TIMEOUT ACTION
XX	NO KEY PRESSED	KEY DOWN: GOTO XL.	KEY DOWN: GOTO XR.	NONE
XL	LEFT KEY PRESSED	KEY UP: STEP LEFT, GOTO XX.	KEY DOWN: GOTO XB.	t > 0.2s: STEP LEFT, GOTO LL.
LL	LEFT KEY HELD	KEY UP: GOTO XX	KEY DOWN: GOTO LR.	t > 0.6s: STEP LEFT.
XR	RIGHT KEY PRESSED	KEY DOWN: GOTO XB.	KEY UP: STEP RIGHT GOTO XX.	t > 0.2s: STEP RIGHT, GOTO RR.
RR	RIGHT KEY HELD	KEY DOWN: GOTO RL.	KEY UP: GOTO XX.	t > 0.6s: STEP RIGHT.
RL	RIGHT KEY PRESSED BEFORE LEFT	KEY UP: JUMP RIGHT, GOTO RR.	KEY UP: GOTO XL.	t > 3.0s: ESCAPE, GOTO WB.
LR	LEFT KEY PRESSED BEFORE RIGHT	KEY UP: GOTO XR.	KEY UP: JUMP LEFT GOTO LL.	t > 3.0s: ESCAPE, GOTO WB.
XB	BOTH KEYS PRESSED AT ONCE	KEY UP: GOTO BR.	KEY UP: GOTO BL.	t > 3.0s: ESCAPE, GOTO WB.
BL	BOTH KEYS PRESSED, LEFT HELD	KEY UP: SELECT GOTO XX.	KEY DOWN: JUMP LEFT, GOTO LR.	t > 0.6s: JUMP LEFT, GOTO LL.
BR	BOTH KEYS PRESSED, RIGHT HELD	KEY DOWN: JUMP RIGHT, GOTO RL.	KEY UP: SELECT, GOTO XX.	t > 0.6s: JUMP RIGHT, GOTO RR.
WB	WAIT FOR BOTH KEYS TO BE RELEASED	KEY UP: GOTO WR.	KEY UP: GOTO XX.	NONE
WL	WAIT FOR LEFT KEY TO BE RELEASED	KEY UP: GOTO XX.	KEY DOWN: GOTO WL.	NONE
WR	WAIT FOR RIGHT KEY TO BE RELEASED	KEY DOWN: GOTO WB.	KEY UP: GOTO XX.	NONE

GRAPHIC USER INTERFACE

- The present invention concerns user interfaces and in particular graphical user interfaces (GUI's). GUI's are now a common part of many items of electrical and electronic equipment and enable a user to interface with the equipment by entering data by pressing keys or buttons so as to select items of data to be entered from a displayed menu.
- 5 One simple example of an item which can frequently include a GUI is the digital watch. With the advent of extremely cheap and small microprocessors and memories it has become a frequent practice to provide digital watches with more and more functions. These can include giving alarms, storing telephone numbers and addresses and also carrying out quite sophisticated calculations.
- 10 It will be appreciated that a wrist watch is relatively small so that any way in which data can be entered into the watch in a simple manner and with a very compact interface will be advantageous. It will also be appreciated that there are many other comparable situations where data has to be entered via a physical interface which is as small or as simple as possible.
- 15
- 20
- 25 One already known approach for entering data is to use a two button GUI in association with a display screen. With such an arrangement it is common for one button to

be used to scroll through a menu displayed on the display screen with the other button being used to select items from the menu.

5     However, this arrangement has problems. For example, if by pressing the first button too many times, the user misses the wanted item, then the user has to carry on through the menu in the hope that it will wrap around to reach the wanted item again. The known arrangement has  
10    further problems in that it lacks flexibility.

The present invention is concerned with providing a solution to this problem.

15    In accordance with the present invention there is provided an interface for inputting data comprising two manually operable direction buttons, and microprocessor means for outputting signals generating a visual display comprising a menu, the microprocessor means in response  
20    to operation of the buttons enabling a user to make selections from the menu and to cause relative movement between the menu and a cursor, and wherein the microprocessor responds to the intermittent pressure of a single button to step the cursor relative to the menu  
25    in a first direction or a second direction in dependence upon the button depressed.

In order that the present invention may be more readily understood an embodiment thereof will now be described by way of example and with reference to the accompanying drawings, in which:

5

Figure 1 is a plan view of a two button GUI;

Figure 2 is a table illustrating the operation of the two button GUI of Figure 1, and

10

Figure 3 is a block diagram of the main circuit elements of the two button GUI of Figure 1.

Referring now to the drawings and in particular to Figure 15 1 it will be seen that it merely shows a display 1 and two button 2 and 3 mounted in a casing 4.

As will be appreciated the display 1 could be part of another piece of equipment such as a watch, a control 20 panel or any other apparatus or device in which data has to be entered.

The display shown on the display panel 1 is shown in simplified form and merely consists of the ten basic 25 numerals and the letters of the alphabet together with an area 5 which is reserved to display data entered via the two buttons 2 and 3. It will be seen that buttons

2 and 3 are respectively marked with the signs < and >. These signs act both to differentiate between the buttons and the to give a partial indication of their functions as will be described hereinafter. Other symbols may be used. For example, if the list is arranged vertically on the screen, 'up' and 'down' arrows may be more useful.

5 It will of course be appreciated that the term "menu" as used in the present specification is intended to cover 10 any list from which items can be selected.

As can be seen in Figure 1 the letter A has been encircled. This circle is intended to represent a cursor which on operation of the buttons can be stepped along 15 the lines of characters and numerals to enable the user of the interface to make a selection. It will be appreciated that this representation of the cursor is purely by way of example and any other suitable visible or audible format could be employed. For example whilst 20 the entire alphabet is displayed on display 1 along with all the ten numerals a directly equivalent effect could be achieved by having a single "window" displaying either a character or a numeral so that operation of a button caused the character or numeral display to be changed 25 sequentially so as to scan through the full range of characters and numerals. This single-character menu display could be made easier to use by adding a bar or

slider to give a graphical display of the progress through the menu. Thus whenever the term cursor and menu is used in this specification it is intended that these terms also encompass any situation just described above.

5

Returning now to the signs on the buttons the sign on button 2 indicates that pressing this button will cause the cursor to move to the left relative to the display whilst operation of the other button will cause relative movement in the opposite direction. Additionally if key 2 is held down then the cursor will continue to step through the menu in the fashion of keyboard auto repeat. Key 3 operates in exactly the same manner but of course in the opposite direction.

15

In order to select an item when the cursor has stopped relative to the memory a user depresses the two keys together then promptly releases them. Naturally it is virtually impossible for a user to depress two keys 20 absolutely simultaneously. Thus in the present embodiment it is assumed that keys pressed within 0.2 seconds of one another were depressed together.

In order for a user to escape, either to another part of 25 the menu display or to signal the end of data entry, the two keys are held depressed for a predetermined period substantially longer than 0.2 seconds. In the present

embodiment this period is three seconds. However, the periods described herein can of course be varied.

In addition to the auto repeat function achieved by holding one of keys 2 and 3 depressed, it is possible to move even more quickly through the menu by holding one key down and then "touching" the other key. In this way the cursor can be made to jump relative to the memory with the direction of the jump being controlled by the key which is held depressed. It will also be appreciated that a two dimensional menu might use these jumps to cause the cursor to move up and down columns rather than along rows.

The basic actions controlled by the buttons are as set out hereinafter in Table A.

TABLE A

	ACTION	RESULT
20	BOTH KEYS UP	NOTHING
	LEFT KEY PRESSED AND RELEASED WITHIN 0.3 SECONDS	1 STEP LEFT
	LEFT KEY PRESSED AND HELD > 0.3 SECONDS	SEVERAL STEPS LEFT
	RIGHT KEY DEPRESSED AND RELEASED WITHIN 0.3 SECONDS	1 STEP RIGHT
	RIGHT KEY DEPRESSED AND HELD > 0.3 SECONDS	SEVERAL STEPS RIGHT
25	BOTH KEYS PRESSED TOGETHER (WITHIN 0.2 SECONDS OF EACH OTHER) AND RELEASED TOGETHER	SELECT
	BOTH KEYS PRESSED TOGETHER AND HELD > 0.6 SECONDS	ESCAPE
	LEFT KEY DEPRESSED > 0.3 SECONDS AND RIGHT KEY DEPRESSED AND RELEASED	JUMP LEFT
	RIGHT KEY DEPRESSED > 0.3 SECONDS AND LEFT KEY DEPRESSED AND RELEASED	JUMP RIGHT

Referring now to Figure 2 of the drawings this shows a more comprehensive table of the operations which can be carried out using the buttons 2 and 3.

- 5      The table in Figure 2 is organised into five columns. The first column, headed "INTERNAL STATE" merely lists two letter names given to each state which can occur during operation of the two keys. The second column, headed "STATE" is a brief description of the actual  
10     state. Thus "XX" is the name of the state where no key has been depressed, XL the name of the state where the key 2 (<) has been depressed, and LL is the state where they key 2 has been depressed and held down and so on.
- 15     The next column "LEFT KEY ACTION" represents the sequence of events which will follow if an action changes the state of the key 2. For each state there is only one possible action. If key 2 is pressed, then the action is to release it. If the key 2 is not pressed, then the  
20     action is to press it. As can be seen from the table, most actions change the internal state.

25     The fourth column entitled "RIGHT KEY ACTION" is similar to the third column but represents the consequences of actions using the right hand key 3 (>).

The final column entitled "TIME OUT ACTION" represents

the consequences of holding the current state until some time limit expires. Some of the states do not have a time limit.

5 An example of how the table shown in Figure 2 operates is as follows.

The state XX, as indicated in the internal state column, is the quiescent state with neither key depressed. If 10 the first action available in the table is taken, namely KEY DOWN: go to XL it will be seen that XL is the state where the left key 2 has been depressed. It will also be seen from the extreme right hand column (TIME OUT ACTION) that there is no time limit that would trigger 15 an action if we had remained in state XX.

Once the XL state has been reached there are two possible actions that do not involve the right key 3. If the key 2 is quickly released, the left key action column shows 20 the cursor steps 1 to the left and the internal state returns to XX. If the key 2 is held down the TIME OUT ACTION column shows that after 0.2 seconds after the key 2 was depressed the internal state changes to LL.

25 However, a further key action is available as indicated in the RIGHT KEY ACTION column. If the right key is depressed before the left key is released, and before the

time limit for state XL is reached, then the internal state changes to XB. State XB is the state reached when the user depresses both keys together.

5 Thus by following the action columns of the table and the resulting in internal states in the internal state column an accurate representation of the operation of the two button action interface can be obtained.

10 It is thus possible to give a some simple exemplary sequences in which data is input for storage using the arrangement shown in Figure 1. It will be assumed that the data to be entered is a person's name and an associated telephone number, and that on activation of  
15 the interface the cursor's start position is the letter A in the alphabetic display. A user can then point to any letter using the keys 2 and 3 by moving the cursor to the desired letter. This can be done step-by-step, by pressing the keys, continuously by holding the keys,  
20 in jumps, or by any combination of any of these actions. Once the letter has been pointed to, both keys are depressed simultaneously to select the letter for entry into the first available space. Once this has been done the next letter is pointed to and so on.

25

Once the alphabetical part of the data to be stored has been input the user can step into the number display and

select numbers in the same manner.

The data input process can be ended by holding down both keys for 3 seconds.

5

It will be appreciated that it is not necessary to display either the whole alphabet or all the numbers on the menu. A single digit display would suffice and instead of a moving cursor the display could step sequentially through the characters and the digits.  
10 Whenever mention is made in this specification of a cursor and a menu which moves relative to the cursor it will be appreciated that the configuration just described above is intended to be included within this definition.  
15 Whichever type of menu is utilised the last menu item can be a choice as to whether or not the data entered is to be saved, with one key equalling the YES and the other key equalling NO.

20 It is possible to extend the table in Figure 2 to recognize other key actions. An example of such a key action is the "roll right", which consists of pressing and holding the left key, pressing and holding the right key, releasing the left key, and finally releasing the  
25 right key.

This two key interface can of course be extended by the

addition of other keys whilst still incorporating the basic feature of using combinations of keys to carry out specific functions. Thus a third key could be added which has the same effect as pressing the two keys  
5 simultaneously. Additionally, if there is a relatively complex menu in tabular form up and down keys ( $\wedge$  and  $\vee$ ) could be added so that a user can jump between rows. In the same manner as the left and right keys, continuous pressure on one key alone could provide a scrolling  
10 action, and holding one key down while tapping the other key could provide rapid jumps over a number of rows.

It is also possible to extend the two button interface by adding other extra buttons. This extended interface  
15 could behave more like a conventional set of cursor keys, but would still have the option to be used as a two button GUI.

It is also possible to implement the two button interface  
20 using a joystick, a joystick key which locks about a pivot, or some other such device. Holding a joystick key to the left or right would correspond to pressing a single key, while pressing a joystick key down would correspond on a two button GUI to pressing both keys.

25

Referring now to Figure 3 of the accompanying drawings this shows the basic elements required for the operation

of the two button GUI which has just been described.

Thus Figure 3 shows a microprocessor 10, a ROM 11 storing operational parameters for the microprocessor 10 and a 5 RAM 12 both for storing data and acting as a temporary store during calculations carried out by the microprocessor. A two button interface is shown at 13 and a circuit 14 detects the pressing and releasing of the buttons of the interface 13. Actual timing is 10 carried out by the internal clock of the microprocessor 10. The microprocessor 10 also controls a driver circuit 15 for a liquid crystal display 16 and power is supplied by a battery 17. The microprocessor is connected to the various circuits which it controls or receives 15 information for by suitable buses indicated at 18. It is of course possible for the display to be any other kind of suitable microprocessor driven display.

It is anticipated that the buttons of the interface will 20 be depressed by a user's fingers but it is of course possible for them to be so small that satisfactory depression and release can only be achieved by using a stylus.

CLAIMS

1. An interface for inputting data comprising two manually operable direction buttons, and microprocessor means for outputting signals generating a visual display comprising a menu, and in response to operation of the buttons enabling a user to make selections from the menu and to cause relative movement between the menu and a cursor, and wherein the microprocessor is adapted to respond to intermittent pressure of a single button to step the cursor relative to the menu in either a first or a second direction in dependence upon the button depressed.
- 15 2. An interface according to claim 1, wherein the microprocessor is adapted to scroll a cursor relative to the menu in one or the other of said directions when the button associated with that direction is held down for a period of time greater than a preset period.
- 20 3. An interface according to claim 2, wherein when one button is held down for a period greater than said preset period and the other button is intermittently pressed the microprocessor causes the cursor to jump relative to the menu.
- 25 4. An interface according to any preceding claim,

wherein simultaneous operation of both buttons enables selection of a menu item.

5. An interface according to any one of the preceding  
5 claims, wherein depressing both buttons for more than a predetermined period of time acts as an escape signal to said microprocessor.

10. An interface according to any one of claims 1 to 4, and including a third key, the microprocessor responding to operation of the third key to select the menu item indicated by the cursor.

15. An interface according to any one of the preceding claims and comprising two further direction buttons operative to generate via the microprocessor cursor movement relative to the menu in direction transverse to said first and second directions.

20. An interface according to any one of the preceding claims wherein the two keys or each pair of keys are replaced by a joystick or by a single key lockable about a pivot point, downward pressure on either the joystick or the single key corresponding to simultaneous pressure  
25 on two keys.

9. An interface according to any one of the preceding

claims and including display means for generating a display in response to the signals output by the microprocessor.

- 5 10. An interface according to any one of the preceding claims and including a memory for storing data input via said buttons.



# The Patent Office

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Application No: GB 9828382.3  
Claims searched: 1-10

Examiner: Mike Davis  
Date of search: 22 April 1999

## Patents Act 1977 Search Report under Section 17

### Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G4H (HKN)

Int Cl (Ed.6): G06F

Other:

### Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2205669 A	(TOSHIBA KIKAI) eg abstract	1 at least
X	GB 2180973 A	(SHARP) eg abstract	"
X	GB 2156560 A	(CASIO) eg abstract and page 2 lines 109-118	"
X	GB 2115965 A	(BECTON DICKINSON) eg abstract and Fig.1	"
X	EP 0264190 A1	(MITA) eg abstract	"
X	WO 98/30004 A1	(ERICSSON) eg abstract and page 4 lines 3-36	1,8 at least
X	WO 86/05143 A1	(SWEDOT) eg abstract	1 at least

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